

Application No. 09/746,744
Filed: December 22, 2000
TC Art Unit: 2666
Confirmation No.: 6878

REMARKS

In response to an Office Action mailed on May 20, 2004, Applicant respectfully requests that the above-listed Amendments be entered and the Application be reconsidered.

The Examiner objected to the drawings, because reference characters "66" and "68" in Fig. 1 were used to designate two different items of the figure. Proposed changes to the drawings are described above.

The Examiner objected to claim 26 due to various informalities. This claim has been amended to overcome the objection. Withdrawal of the objection is respectfully requested.

The Examiner rejected claims 27, 29 and 30 under 35 U.S.C. 112 as being indefinite. Claim 27 has been amended to recite "said master clock system." Claims 29 and 30 have been amended to make these claims depend from claim 28. Withdrawal of the rejections is respectfully requested.

The Examiner rejected claims 1-10, 12-21 and 25-30 under 35 U.S.C. 102(e) as being anticipated by US Pat. No. 6,038,230 to Yoram Ofek ("Ofek").

Ofek discloses a packet switching system that utilizes a common time reference and time frames to forward packets among switches that are interconnected by links that exhibit varying delays. Packets received by a switch during a first time interval are forwarded by the switch during a second time interval. (Ofek: column 8, lines 55-59.) The forwarding times are not, however, fixed. The forwarding time is selected based on the time at which each data packet arrives. Thus, the forwarding time changes as a result of changes in the delay characteristics of an incoming link. (Ofek: column 9, lines 6-14.) Furthermore, a packet can be forwarded at one of several possible time frames. (Ofek: column 9, lines 15-17.) Timing information is not, however, used for routing the packets through the switch. Routing is done using IP addresses or labels and tags. (Ofek: column 6, lines 19-22.)

In contrast, the presently disclosed system uses timing information for routing packets through a switch, and the presently disclosed system does not use destination information in the header of the packet for routing the packet. The presently disclosed system includes a scheduler that establishes a real-time data path, from a source host, through one or more links and one or more switches, to a destination host. The real-time path includes a link connected to an input port of each

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switch, a cross connection from the input port to a respective output port on that switch, and a link extending from the output port to the next input port. The scheduler establishes a "schedule," i.e. a recurring time slot, in each of the switches along the real-time data path. The scheduler allocates the input ports and the output ports of the switches during these time slots. During this schedule, all packets arriving on the input ports are automatically routed to the output ports, without examining destination information in the headers of the packets.

It one embodiment, a switch control CPU (SCC) 43 controls a crosspoint matrix 32 to route packets arriving on incoming ports to outgoing ports. (Application: Fig. 1.) The crosspoint matrix 32 includes a plurality of switches 284 that interconnect the incoming ports with the outgoing ports. (Application: Fig. 7.) A set of current latches 67 controls the settings of the switches 284. Before each time slot, a set of new latches 66 is configured by the SCC 43. Then, at the beginning of the time slot, the contents of the new latches are loaded into the current latches 67 to set up the crosspoint matrix configuration. (Application, page 30, last paragraph.) During the time slot, the incoming ports are cut through the crosspoint matrix to the outgoing ports, as determined by the settings of the switches 284. Thus, any packets arriving on the incoming ports are immediately forwarded to the outgoing ports (as determined by the settings of the switches), without examining destination information in the headers of the packets.

The Examiner cited Ofek (column 15, lines 35-38) as disclosing "forwarding said packet based on said packet arrival time in accordance with said forwarding information associated with said packet flow," as substantially recited in claims 1, 12, 25 and 28. As noted above, Ofek uses the arrival time of a packet to select a subsequent forwarding time for that packet, and Ofek uses information in the packet header to select an outgoing port. In contrast, systems according to the present disclosure pre-establish a path through the crosspoint matrix for the duration of a time slot, so packets arriving during the time slot are immediately forwarded to their respective outgoing ports, without having to examine the headers of the packets.

Thus, the phrase "based on said packet arrival time" in the recited claims does not mean that the time at which a packet arrives is used to select a forwarding time or to select an outgoing port, as in Ofek. Instead, the phrase means a forwarding path has been pre-established through the switch

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for a particular time slot, and, if a packet arrives during that time slot, the packet will be forwarded by the pre-established forwarding path.

Similarly, in claim 25 and 28, the phrase "to determine a transmit time of a received packet" does not mean that the time at which a packet arrives is used to select a forwarding time or to select an outgoing port, as in Ofek. Instead, the phrase means pre-determining a transmit time.

As a result of these pre-established forwarding paths, real-time packets are not queued by the switches. Instead, the packets are forwarded as soon as they arise. In fact, in some embodiments, a switch can begin to forward a packet before the packet is completely received by the switch. It is, therefore, possible to predict the time at which a packet will be forwarded from a switch along its route with a resolution that is shorter than the data unit transmission time. In contrast, in Ofek's system, it is only possible to predict the time at which a packet will be forwarded from any switch along its route with an accuracy that is much larger than one data unit transmission time. (Ofek: column 5, line 57 to column 6, line 7.)

It is believed that no art of record, either alone or in combination, discloses, teaches or suggests a method or apparatus for switching data packet flows, as recited in claims 1, 12, 25 and 28. For at least this reason, these claims are believed to be allowable.

The dependent claims depend directly or indirectly from claim 1, 12, 25 or 28. The dependent claims are, therefore, believed to be allowable, for at least the reasons discussed above with respect to claims 1, 12, 25 and 28.

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The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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